

007034 USA P02/DSM/ELK/JP
Application No: 10/783,748
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By this amendment, claims 1 and 4-23 are pending in the application, of which claims 1, 7, 8, 12, 16 and 20 are being amended and claim 23 is being added.

Claims 7, 12 and 20 are being amended to cosmetically improve the claims without affecting the scope of the claim; and thus, the scope of the doctrine of equivalents applied to the claim should not be limited under the rules of *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 2002 Lexis 3818 (May 28, 2002).

Independent claims 1, 8 and 16, are being amended to recite generating an electron beam current through a cleaning gas to energize the cleaning gas in the chamber. This language is supported by the Specification at least by paragraph [0032] at pages 12 - 13. The proposed amendment only makes express, a recitation of a feature that was already inherent in the original claim, and thus, is not a narrowing of the scope of the properly construed claim. TurboCare v. General Electric Co., 264 F.3d 1111 (Fed. Cir. 2001); Bose Corp. v. JBL, Inc., 274 F.3d 1354 (Fed. Cir. 2001); and Interactive Pictures Corp. v. Infinite Pictures, Inc., 274 F.3d 1371 (Fed. Cir. 2001).

Claim 16 is also being amended to broaden the claim, and the previous limitation of 10 kV is now provided in the new claim 23. The limitations of *Festo* do not apply as the amendment broadens the claim instead of narrowing the same.

Thus, the claim amendments and new claims are fully supported by the originally filed Specification, claims, and add no new matter. Entry of the amendments, new claims and reconsideration of the present case is thus respectfully requested.

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PAGE 8/16 * RCVD AT 6/26/2006 10:26:44 PM [Eastern Daylight Time] * SVR:USPTO-EFAXRF-5/20 * DNIS:2738300 * CSID:4155388380 * DURATION (mm-ss):04-08

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Rejections Under 35 U.S.C. § 103(a)

The Examiner rejected claims 1 and 4-22 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,539,211 issued to Ohtoshi et al. ("Ohtoshi et al.").

"In making the assessment of differences between the prior art and the claimed subject matter, section 103 specifically requires consideration of the claimed invention 'as a whole.'" Princeton Biochemicals, Inc. v. Beckman Coulter, Inc. (Fed. Cir., No. 04-1493, 6/9/05). "[S]imply identifying all of the elements in a claim in the prior art does not render a claim obvious. Ruiz v. A.B. Chance Co., 357 F.3d 1270, 1275 (Fed. Cir. 2004). Instead, § 103 requires some suggestion or motivation in the prior art to make the new combination. In re Rouffef, 149 F.3d 1350, 1355-56 (Fed. Cir. 1998). The benefits of the claimed invention should be viewed without the benefit of impermissible hindsight vision afforded by the claims themselves.

Claim 1

Ohtoshi et al. does not teach or suggest claim 1, as amended, because Ohtoshi et al. does not teach generating an electron beam current through a cleaning gas to energize the cleaning gas in the chamber of the electron beam treatment apparatus, monitoring an electron beam current, adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value, and stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time.

The Examiner states that Ohtoshi et al. teaches "generating an electron beam 7 that energizes a cleaning gas (O₂, CF₄) in the chamber of the electron beam treatment apparatus (col. 11, line 50 to col. 12, 58 and FIG. 2)".

However, Applicant respectfully submits that Ohtoshi et al. does not teach generating an electron beam current through a cleaning gas to energize the cleaning gas in the chamber of the electron beam treatment apparatus, as claimed. At the section cited by the Examiner, namely col. 11, line 50 to col. 12, 58 and FIG. 2, Ohtoshi et al. teaches that the electron beam exposure apparatus comprises:

... an introducing port for introducing plasma used for cleaning and an exhausting port used for exhausting. The introducing port is connected with a generating apparatus provided outside the apparatus.... The plasma generating apparatus 2 is arranged such that plasma source applied from a source tank can be generated by means of such as microwave excitation....

In the next, a method of cleaning the inside of an electron beam exposure apparatus having a cleaning function thus constructed will be explained below. At first, gate valves 6 are closed, and a gas of O₂ and CF₄ is supplied to the plasma generating apparatus 2 from a source tank 3 with a gas being exhausted at a pressure of 0.5 Torr by an exhausting pump 4. Thereafter, plasma is generated by a microwave excitation at a frequency of 2.45 GHz and a power of 100 W. Generation of plasma is kept for five minutes thereby to clean the cleaning portions 9 to be cleaned.

Column 12, line 41 to column 13, line 1.

Thus, Ohtoshi et al. teaches using a microwave plasma generated outside the electron beam chamber, and which is introduced by an introducing port into the electron beam chamber, to clean the chamber. The microwave plasma is formed by coupling microwaves to a cleaning gas. The microwave plasma taught by Ohtoshi et al. is not the same as "generating an electron beam current through a cleaning gas to energize the cleaning gas." Specifically, an electron beam current is generated by passing electrons from a cathode to an anode inside the chamber, and these electrons energize the cleaning gas. Microwaves are not electrons. Thus, Ohtoshi et al.'s teachings to a microwave activated cleaning plasma do not render obvious the claimed process in which an electron beam current is passed through cleaning gas to energize

the gas.

Furthermore, Ohtoshi et al.'s teachings to a microwave plasma to clean an electron beam chamber do not render obvious the use of an electron beam to clean the chamber. Operation of an external microwave plasma generating chamber to generate a microwave activated cleaning plasma, is not the same as applying an electron beam current to cleaning gas to clean the chamber. Applicant's discovery does not couple microwaves to the cleaning gas, and consequently does not use a microwave generating chamber. Ohtoshi et al. does not teach applying an electron beam current to the cleaning gas, and in fact, teaches away from the claims by teaching that an external microwave activated plasma is necessary to clean the electron beam apparatus. Consequently, Ohtoshi et al. provides no motivation to derive the present claims. The Examiner is deriving the present claims from Ohtoshi et al. in hindsight vision, and based on Applicant's own disclosure.

The Examiner further states that Ohtoshi et al. discloses "wherein the predetermined condition is that the cleaning gas pressure becomes substantially constant for predetermined length of time".

However, this is incorrect, as Ohtoshi et al. does not teach the claimed process step of adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value. As explained above, Ohtoshi et al. the microwave activated plasma species are formed in a plasma generation portion 2 which is separate from and outside the electron beam column 1. Ohtoshi et al. further teaches:

... the inside of the column 1 being kept depressurized at a pressure of 10^{-7} Torr, plasma (active species) of 10^{-2} to several 10 Torr can be made flow [sic], so that a time for recovering the depressurized pressure after cleaning can be greatly shortened.

Col. 11 lines 50 to col. 12, line 9. Thus, Ohtoshi et al. teaches that it is desirable to maintain a low pressure of 10^{-7} Torr in the electron beam column 1 to allow the

microwave activated plasma which is externally formed at a higher pressure of 10^{-2} to several 10 Torr in the plasma generating portion 2, to flow into the lower pressure column 1. Ohtoshi et al. teachings to setting a constant pressure in the electron beam column, namely 10^{-7} Torr, are inopposite to "adjusting a pressure of cleaning gas" as claimed in claim 1. Furthermore, setting a constant low pressure in the electron beam column 1 to "suck" in plasma species formed at a higher pressure outside the column do not motivate the claim language of "adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value." Also, nowhere does Ohtoshi et al. disclose "adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value" as claimed in claim 1. Applicant respectfully request Examiner to provide a citation to the section in Ohtoshi et al. which has this specific teaching, and absent the same, claim 1 should be allowable over Ohtoshi et al..

Furthermore, Ohtoshi et al. also does not teach or suggest "stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time" as claimed in claim 1. Applicant has discovered that the endpoint of the electron beam cleaning process can be readily determined by monitoring the pressure of the cleaning gas. This is demonstrated by FIG. 3 in the present Specification which clearly shows that the cleaning gas pressure gradually reduces and becomes substantially constant as the cleaning process is performed. Thus, and as further explained in the specification, "...as the source becomes clean, it operates at a low pressure for a given electron beam current because it is believed that a clean source produces electrons more efficiently than a dirty one." Paragraph 0033 in line 20-22. That the cleaning gas pressure can be monitored to determine an endpoint of the cleaning process is not taught or suggested by Ohtoshi et al..

Furthermore, Ohtoshi et al. does not teach the claimed process step of stopping the flow of cleaning gas when the cleaning gas pressure becomes substantially constant for a predetermined length of time. If the cleaning process of Ohtoshi et al. were stopped when the cleaning gas pressure becomes constant, as

presently claimed, there would be no cleaning process because the Ohtoshi et al. teaches that the gas pressure is held constant from the very beginning of the cleaning process. Applicant is claiming stopping the cleaning gas flow when the cleaning gas pressure becomes constant. During the cleaning process, the pressure of cleaning gas is purposefully changed to maintain a particular electron beam current. However, when the residues are all cleaned off, the cleaning gas pressure automatically drops to a substantially constant level, and at this time, Applicant stops the flow of cleaning gas. This is opposite to the teachings of Ohtoshi et al. to maintain a constant pressure throughout the cleaning process. Thus, Ohtoshi et al. does not teach or suggest the endpoint determining mechanism, and the step of stopping the flow off the cleaning gas, when the gas pressure becomes constant as claimed in claim 1.

For these reasons, Ohtoshi et al. does not teach or suggest claim 1, as a whole, or even in parts. Consequently, claim 1 and the claims dependent therefrom, are not obvious over Ohtoshi et al..

Claim 8

Ohtoshi et al. does not teach generating an electron beam current though a cleaning gas to energize the cleaning gas in the electron beam treatment chamber as recited in claim 8. Instead, as explained in more detail above, Ohtoshi et al. teaches using a microwave plasma generated outside the electron beam chamber to clean the chamber. The microwave plasma is formed by coupling microwaves to a cleaning gas and not by passing an electron beam current through the cleaning gas. The microwave plasma is not the same as generating an electron beam current though a cleaning gas to energize the cleaning gas, as claimed. The electron beam current is generated by passing electrons from a cathode to an anode inside the chamber to cause free electrons energize the cleaning gas. Microwaves are not the same as electrons, and thus, teachings to a microwave activated cleaning plasma do not teach or suggest applying an electron beam current through a cleaning gas.

Furthermore, Ohtoshi et al. also does not teach claim 8 because Ohtoshi et al. does not teach stopping the flow of cleaning gas after the cleaning gas pressure becomes substantially constant for a predetermined length of time. As explained above, Applicants have discovered that the endpoint of the cleaning process can be determined by monitoring the pressure of the gas in the chamber. As shown in FIG. 3, it was discovered that the gas pressure gradually reduces to substantially constant value with the progress of the cleaning process. Thus, upon reaching an endpoint after the cleaning gas pressure becomes substantially constant for a predetermined length of time, the cleaning gas flow is stopped. Ohtoshi et al. does not teach that the cleaning gas flow should be stopped when the gas pressure becomes substantially constant or the benefits of being able to determine when to stop the cleaning process, namely, less downtime of the electron beam apparatus arising from the cleaning process. Thus, Ohtoshi et al. does not render obvious claim 8 or the claims dependent therefrom.

Claim 16

Ohtoshi et al. also does not teach claim 16, which recites, inter alia, generating an electron beam current through the cleaning gas to energize the cleaning gas in the chamber. Instead, Ohtoshi et al. teaches coupling microwaves to the cleaning gas in a plasma generating chamber outside the electron beam chamber, to form a microwave activated plasma, and then introducing the microwave activated plasma into the electron beam chamber to clean the chamber. The microwave plasma is not the same as generating an electron beam current through the cleaning gas, as claimed. The electron beam current is generated by passing electrons from one electrode to another in the chamber to cause free electrons to energize the cleaning gas. Ohtoshi et al. does not teach or suggest applying an electron beam current through a cleaning gas, and the same is not motivated by teachings to apply microwaves to the cleaning gas.

Nor does Ohtoshi et al. teach the process step of setting an electron beam current of about 1 mA or above in the chamber, as claimed in claim 16. In fact, Ohtoshi

et al. does not apply an electron beam current to the cleaning gas but instead applies microwaves to the cleaning gas. Ohtoshi et al. provides no teaching or suggestion to motivate applying an electron beam current of about 1 mA or above, to the cleaning gas.

Furthermore, Ohtoshi et al. does not teach adjusting a pressure of the cleaning gas to maintain the electron beam current at a substantially constant value. Ohtoshi et al. teaches maintaining a particular and constant pressure during the cleaning process – not adjusting the pressure of the gas. In fact, Ohtoshi et al. teaches against the claimed process step of adjusting the pressure of the cleaning gas by teaching that a constant partial pressure of a gas is needed. Further, Ohtoshi et al. does not teach stopping the cleaning gas flow when the cleaning gas pressure becomes constant. Ohtoshi et al. teaches the opposite by teaching that the partial pressure of the oxidizer gas should be held constant during the gas cleaning process, instead of stopping the cleaning process when the gas pressure becomes constant. Thus, Ohtoshi et al. does not teach adjusting the pressure of cleaning gas to maintain the electron beam current at a substantially constant value, as recited in claim 16, and the claims dependent therefrom.

Also, Ohtoshi et al. does not teach determining an endpoint of the cleaning process and stopping introduction of the cleaning gas when the cleaning gas pressure reaches a substantially constant value and maintains the value for a length of time of 5 seconds. Instead, Ohtoshi et al. teaches maintaining a constant gas pressure from the beginning to the end of the cleaning process. Applicant is claiming stopping the cleaning gas flow when the cleaning gas pressure becomes constant. In the claimed cleaning process, the pressure of cleaning gas is purposefully changed to maintain a particular electron beam current. However, when the residues are all cleaned off, the cleaning gas pressure gradually drops to reach a substantially constant level, and at this time, Applicant determines an endpoint of the cleaning process and stops the flow of cleaning gas. This step provides efficient cleaning and minimizes chamber down time. This is opposite to the teachings of Ohtoshi et al. to maintain a

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constant pressure throughout the cleaning process.


Thus, Ohtoshi at el. does not teach or suggest claim 16 or the claims dependent therefrom.

For the foregoing reasons, allowance of the present claims is respectfully requested. Should the Examiner have any questions regarding the above amendments or remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,
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